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**SUMMARY OF PACIFIC SALMON CODED WIRE TAG AND THERMAL MARK  
APPLICATION AND RECOVERY, PRINCE WILLIAM SOUND, 1998.**



by  
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## **PREFACE**

This report was prepared as part of cooperative agreements between the Alaska Department of Fish and Game, the Prince William Sound Aquaculture Association, and the Valdez Fisheries Development Association for State Fiscal Year 1998.

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## INTRODUCTION

Primary reporting duties for the Prince William Sound/Copper River sockeye salmon Coded-Wire Tag Project and pink salmon Otolith Project have been associated with generation of technical reports for the *Exxon Valdez* Oil Spill Trustee Council. While these reports provide much technical information, they do not evaluate day-to-day project operations and may not present all information desired by cooperating private non-profit aquaculture associations, i.e. the Prince William Sound Aquaculture Corporation (PWSAC) and Valdez Fishery Development Association (VFDA). In order to better address the information needs of the aquaculture associations, the Alaska Department of Fish and Game (ADF&G) agreed to submit a separate annual report which summarized sockeye tagging and tag recovery, and pink salmon otolith mark and mark recovery activities which presented estimates of hatchery contributions and survival rates by fishing period and week for sockeye and pink salmon.

Funding for sockeye salmon coded-wire tag (CWT) recovery was initiated in 1996 in a cooperative agreement with PWSAC and sockeye salmon tagging and recoveries will be summarized in this report. Hatchery sockeye salmon production is generated from two hatcheries, Main Bay and Gulkana, both operated by PWSAC. Most of the production from the Main Bay hatchery is harvested in the Eshamy District in Prince William Sound (PWS), but some is also harvested as remote release fish en route to Coghill lake. Gulkana hatchery adult returns are generated from fry stockings into lakes on the Copper River system and the resulting production contributes to the marine commercial gill net fishery, the river personal use dip net fishery and the subsistence fishery.

CWT information from sockeye salmon returning to the Copper River system is used to estimate the timing of returns and contributions to the common property commercial fishery and more recently to the sport dip-net fishery. Some cost recovery occurred on the Crosswind Lake component of the Gulkana Hatchery production after it separated itself from the other Copper River stocks.

Chum and coho salmon are briefly covered in this report. Neither chum nor coho salmon were scanned for CWT's in the common property and cost recovery fisheries. Chum and coho salmon hatchery returns were estimated using historic catch information and should be considered as approximate estimates. No mark recapture method was used to derive these estimates.

Management of the chum and coho salmon harvest is not dependent on CWT information. Concerns about wild stock interception in the Wally H. Noerenberg (WHN) hatchery chum salmon fishery is limited to incidental harvest of Coghill lake sockeye salmon. Wild stock harvests are not considered significant in the hatchery coho salmon fisheries with nearly the entire coho salmon catch in the Coghill District and in the Port of Valdez considered to be of hatchery origin.

Management of pink salmon harvests in PWS has become more complex with increased hatchery production. Harvesting the surplus hatchery production without over-harvesting the wild stock component is the responsibility of the area management biologist. This harvest must occur while the quality of the fish is still high and therefore requires commercial harvests throughout the migration. The otolith program was initiated so that inseason management decisions could be made rapidly and with confidence. Data from otolith recoveries in test and commercial common property fisheries were crucial to the separation of the hatchery and wild components in a mixed stock fishery and thus to the ability of managers to make informed decisions on fishing periods and times.

The CWT and otolith programs both consist of two components, tag or mark application and tag or mark recovery. Pink salmon have a two-year life cycle, and otolith thermal mark application occurs in the first fall when the fish are still in the embryonic stage. Those marks applied in brood year 1996 were recovered in 1998.

The marine residency of hatchery produced sockeye salmon is variable, and tags applied in 1998 at the Main Bay and Gulkana facilities will be recovered over several years. Tag recoveries from the summer of 1998 provide hatchery contribution estimates, but can only provide partial survival information for most brood years as some year classes have yet to return.

## **METHODS**

### ***Applying Tags***

The only two hatcheries in PWS that apply CWT's are Main Bay and Gulkana which produce sockeye salmon. Tagging procedures are similar at both hatcheries and are described in detail in the 1994 Coded Wire Tag Project Report to the *Exxon Valdez* Oil Spill Trustee Council (Restoration Project 94320B). Fish to be tagged are randomly selected from their release group, marked, and released with their cohorts. At Main Bay hatchery about one sockeye salmon in every 40 is tagged. Gulkana hatchery has been an exception where sockeye salmon tagging ratios have ranged from one in 7 to one in over 70. Efforts were initiated in 1996 to standardize the tagging ratio from this hatchery's production at one in 15. Adult returns in 1999 will contain all release groups tagged at the standard rate.

In 1998, Main Bay hatchery released 69,744 tagged sockeye salmon on site. The Gulkana hatchery tags smolt as they migrate through weirs on Summit and Crosswind lakes. While fry are also planted into Paxson lake, tags are not applied to the migrating smolt because of a large resident wild population. A total of 102,878 and 65,444 smolt were tagged at Summit and



Crosswind lakes respectively with 101,098 and 64,886 valid tagged smolt released at the respective lakes. The difference in the number tagged and valid tags released can be attributed to mortality and loss of tag prior to release.

### *Applying Thermal Marks*

Thermal marks are applied to the otolith bones during incubation by rapidly changing the incubating water temperature by approximately four degrees Celsius with at least 24 hours between changes. In the case of PWS pink salmon, the water is heated with oil fired boilers to achieve the proper temperature change. The WHN hatchery applies thermal marks to their early run chum salmon by manipulating different water supply sources to the hatchery to create the necessary temperature change. The base identifying marks are applied to embryos after development to the “eyed” stage and prior to hatch. Accessory marks are generally applied after the embryo has hatched, but prior to swim-up and migration.

### *Recovering Tags*

Tags are recovered inseason from sockeye salmon harvested during common property and cost recovery fisheries. As salmon are pumped onto tenders or from tenders onto conveyer belts in processing plants, technicians count every salmon examined and remove the head from every salmon with a missing adipose fin. An attempt was made to sample about 5% of the total harvest of sockeye salmon in this manner to ensure that a sufficient number of tags are collected to produce accurate and precise estimates of hatchery contributions.

Tags are also recovered daily from hatchery brood stocks during the egg take procedure at each sockeye facility. All of the sockeye salmon utilized by the hatchery for egg production, egg sales or surplus are examined for tags. These fish are counted and the head is removed from any fish with a missing adipose fin.

All of the sampled heads are sent to the CWT and Otolith Processing laboratory in Juneau, Alaska where the tag is removed and the code read and recorded.

### *Recovering Otoliths*

At the conclusion of a common property or cost recovery fishery, otoliths are recovered by systematically sampling tender loads delivered to processors. The systematic samples are collected by removing the otolith pairs from one salmon passing along the processor belt every few minutes. The entire tender is sampled in this manner so that a sample is taken throughout the load. If possible, all tenders from several different processors containing salmon from one fishing district and one fishing period are sampled. A weighted sample of 96 otoliths, culled from all otoliths collected after an opening, is formed using a proportional allocation scheme; each sampled tender contributed otoliths to the sample of 96 in proportion to its load. Another sample of 96 otoliths formed in a similar manner is taken and stored for possible postseason use. The total catch for that period and district, used in calculation of the weights, is obtained from the ADF&G fish ticket system. The recovered sample of 96 otoliths is sent to the Cordova Fish and Game otolith laboratory for mounting and microscopic examination. After the origin of an otolith is determined, the information is transferred to an Access™ computer database prior to calculating the hatchery contribution to the fishery opening.

Otoliths are recovered in a similar manner from hatchery brood stocks and are identified as described above. A total daily count of the pink salmon spawned is used in place of the daily “catch”, and a sample target of 400 otoliths per brood stock is taken.

All the otoliths that are mounted, read and used for catch contribution calculations are sent to the CWT and Otolith Processing laboratory in Juneau for a quality control second reading. Any reading errors found in the quality control process are corrected in the database and the contribution number is recalculated.

### *Estimating Hatchery Contributions with Coded Wire Tags*

Sockeye salmon common property and cost recovery fishery samples were stratified by harvest, district, period, and processor.

The contribution of release group  $t$ ,  $C_{St}$ , to the sampled common property and cost recovery harvests, escapements and brood stocks, was estimated as:

$$\hat{C}_{St} = \sum_{i=1}^L x_{it} \left( \frac{N_i \hat{a}}{s_i p_t} \right),$$

where

$x_{it}$	=	number of group $t$ tags recovered in the $i$ th stratum,
$N_i$	=	total number of fish in the $i$ th stratum,
$s_i$	=	number of fish sampled from the $i$ th stratum,
$p_t$	=	proportion of group $t$ tagged,
$a$	=	adjustment factor associated with the MB or Gulkana facilities (1998); and,
$L$	=	number of recovery strata associated with common property, cost recovery, brood stock, and special harvests in which tag code $t$ was found.

The adjustment factor, for a given year, is estimated as the ratio of sampled sockeye salmon in the brood stock to the expanded number of fish based on tags found in the sample and is expressed as:

$$\hat{a} = \frac{s}{\sum_i \frac{x_i}{p_i}},$$

where,

$T$	=	number of tag codes released from the hatchery in previous years.
$p_i$	=	tagging rate at release for the $i$ th tag code (defined as number of tagged fish released with the $i$ th code divided by the total number of fish in release group $i$ ),
$x_i$	=	number of tags of the $i$ th code found in $s$ and,
$s$	=	number of brood stock fish examined in the hatchery brood stock.

The adjustment factor used in 1998 was calculated as the specific hatchery adjustment factor for 1998. The purpose of an adjustment factor is to remedy violations of the assumptions that 1) mortality of tagged and untagged pink salmon within a release group is the same and 2) marked sockeye salmon do not lose tags.

An adjustment factor of 1.0 was used for the Main Bay hatchery sockeye salmon returns. This adjustment factor was calculated from historical brood stock data collected at the Main Bay facility. The calculation assumes that the adjustment factor is equal for fish of different ages, and for fish tagged in different years. A review of the methodology used to account for shed tags and differential mortality is underway.

Adjustment factors for sockeye salmon from Gulkana hatchery were based on 1998 samples. The adjustment factor calculated for Crosswind lake was 2.84 which is very close to the 1996 adjustment factor of 2.65 and 2.62 for 1997. The adjustment factor for Summit Lake was 2.52.

The high adjustment factors imply that fish tagged at Crosswind and Summit Lakes experienced some combination of high tag loss rates, and differential mortalities. By contrast, the adjustment factors for Summit Lake sockeye in 1996 and 1997 were 1.0 and 3.52 respectively. The number of heads recovered with tags in 1998 remained stable at about 81.8% for Crosswind Lake and 79.6% for Summit Lake for most of the season. The calculations for Crosswind lake were made more complicated than those for Summit lake because of a subsampling procedure used on the Crosswind lake tagged adults. Assuming the subsampling was random little impact would be expected on the adjustment factor. A review of the method of calculation of the Gulkana adjustment factors will be made prior to the 1999 season.

The contribution of release group  $t$  to unsampled strata,  $C_{Ut}$ , was estimated from contribution rates associated with strata which were sampled from the same district-week openings as the unsampled strata and is expressed as:

$$\hat{C}_{Ut} = \sum_{i=1}^U N_i * \left[ \frac{\sum_{j=1}^S \hat{C}_{Stj}}{\sum_{j=1}^S N_j} \right],$$

where

$U$	=	number of unsampled strata,
$N_i$	=	number of fish caught in $i$ th unsampled stratum
$S$	=	number of strata sampled in the period in which the unsampled stratum resides,
$C_{Stj}$	=	contribution of release coded with tag $t$ to the sampled stratum $j$ , and
$N_j$	=	number of fish in $j$ th sampled stratum.

An estimate of the contribution by tag code  $t$  to all strata, sampled and unsampled, is given by

$$\hat{C}_t = \hat{C}_{St} + \hat{C}_{Ut}$$

A variance approximation for  $\hat{C}_t$ , derived by Clark and Bernard (1987) and simplified by Geiger (1990) was used:

$$\hat{V}(\hat{C}_t) = \sum_{i=1}^L x_{it} \left[ \frac{N_i \hat{a}}{s_i p_t} \right] \left[ \frac{N_i \hat{a}}{s_i p_t} - 1 \right].$$

Summation of variance components over all tag codes provided an estimate of the variance of the total hatchery contribution. Variance components associated with unsampled strata are assumed negligible.

Estimation of the wild stock production from Coghill and Eshamy lakes was made by summing all of the sockeye salmon harvested and removing all the hatchery production calculated from CWT recoveries. All sockeye salmon caught in the Coghill District in excess of hatchery production were assumed to be Coghill wild stock. Since the common property fishery in the Eshamy district occurred after the Coghill wild stock run was complete, no Coghill wild stock were considered to have been caught in that fishery. None of the smolt released in 1996 contained CWT's, thus none were present in the returning adults. Since the fishery was contained within the Main Bay sub-district, all of the sockeye salmon caught in the Eshamy District common property fishery were considered Eshamy hatchery stock. All the sockeye salmon harvested in the Southwest District were considered Eshamy wild stock production. Wild stock sockeye salmon harvested in other districts were considered as contributions from other stocks and not included in either the Coghill or Eshamy lake production.

Estimates of contributions of chum salmon produced by the WHN hatchery to the common property and cost recovery fisheries were made by subtracting a pre-hatchery average catch from the years 1971 through 1983 (121,621) from the total catch in the Coghill District. The chum salmon catch in the Eshamy District was treated slightly differently and the estimation method is much more suspect. There is no historic chum salmon catch prior to July 31 in this district. Prior to Main Bay hatchery production, the Eshamy District opened for harvesting Eshamy lake sockeye salmon in late July and August and the chum salmon that were captured incidentally at that time were of late stock origin. It was only after the initiation of hatchery production of early chum salmon that fishing occurred in June and early July in the Eshamy District. As a result, no historic catch of early run wild chum salmon stocks exists. Only in 1994 does data exist from CWT recovery in the Eshamy District for chum salmon catch prior to July 31. An estimated 7,730 wild chum salmon were captured in 1994 based on CWT recovery that year. This number was subtracted from the Eshamy District chum salmon harvest prior to July 31 to arrive at the hatchery contribution rate for 1998.

The Solomon Gulch hatchery chum salmon production was estimated in a similar manner to that of the WHN hatchery. The average wild chum salmon catch from 1978 - 1984 (157,077) in the subdistricts encompassing the Valdez arm was subtracted from the total catch in that area in 1998 to arrive at the hatchery contribution. Most of the catch in the Eastern District came from those subdistricts, however, some chum salmon harvest occurred in other subdistricts, but those fish were considered all wild stock harvest.

Pre-hatchery historical catches of coho salmon in the Coghill District averaged 1000 fish while those in the subdistricts around the Valdez arm in the northern part of the Eastern District near the Solomon Gulch hatchery averaged 500 fish. The hatchery production of this species at these

two sites is based on the total catch less the historical catch plus the estimated sport catch, cost recovery catch and brood stock.

### *Estimating Hatchery Contributions with Otoliths*

Otolith-derived estimates of the contribution of hatchery  $h$ ,  $C_{sh}$ , to the sampled common property and cost recovery harvests, escapements and brood stocks, were calculated as follows:

$$\hat{C}_{sh} = \sum_{i=1}^Q \frac{o_{hi}}{n_i} N_i$$

where,

- $o_{hi}$  = Number of otoliths from hatchery  $h$  in sample  $n_i$
- $n_i$  = Number of otoliths sampled from stratum  $i$  (usually 96)
- $N_i$  = Number of fish caught in stratum  $i$
- $Q$  = number of recovery strata associated with common property, cost recovery, brood stock, and special harvests in which otoliths from hatchery  $h$  were found.

An estimate of the contribution by hatchery  $h$  to unsampled strata (very few),  $\hat{C}_{uh}$ , was made in a manner similar to that for the CWT program.

An estimate of the contribution by hatchery  $h$  to all strata, sampled and unsampled, is given by

$$\hat{C}_h = \hat{C}_{sh} + \hat{C}_{uh}$$

A variance estimate for  $\hat{C}_h$  is given by:

$$\hat{V}(\hat{C}_h) = \sum_{i=1}^Q \frac{N_i^2 o_{hi}}{n_i^2} \left( 1 - \frac{o_{hi}}{n_i} \right)$$

For any sampled stratum, the estimate of the proportion of the catch comprised of hatchery fish is made such that there is a 95% chance that it is within 10% of the true proportion. When combined over strata, the precision of the estimated hatchery contribution improves.

### *Estimating Survival Rates with Coded Wire Tags*

The survival rate of the release group coded with tag  $t$  ( $S_t$ ), was estimated as:

$$\hat{S}_t = \frac{\hat{C}_{st} + \hat{C}_{ut}}{R_t},$$

where

$R_t$  = total number of fish in release group coded with tag  $t$  released from hatchery.

Assuming the total release of salmon associated with a tag code is known with negligible error, and that the cumulative variance contributions associated with the unsampled strata are small, a suitable variance estimate for  $S_t$  is given by:

$$\hat{V}(\hat{S}_t) = \frac{\sum_{i=1}^L x_{it} \left[ \frac{N_i \hat{a}}{s_i p_t} \right] \left[ \frac{N_i \hat{a}}{s_i p_t} - 1 \right]}{R_t^2}.$$

### *Estimating Survival Rates with Otoliths*

An estimate of the survival rate for hatchery  $h$ ,  $S_h$ , was made from otolith recoveries as follows:

$$\hat{S}_h = \frac{\hat{C}_{sh} + \hat{C}_{uh}}{R_h}$$

where,

$R_h$  = Number of pink salmon released from hatchery  $h$ .

An approximate variance of  $\hat{S}_h$  is given by:

$$\hat{V}(\hat{S}_h) = \frac{\sum_{i=1}^Q \frac{N_i^2 o_{hi}}{n_i^2} \left(1 - \frac{o_{hi}}{n_i}\right)}{R_h^2}$$

There were very few unsampled strata and the variance associated with  $\hat{C}_{uh}$  is assumed negligible.

## RESULTS AND DISCUSSION

Much of the CWT information supplied in the following section was derived from CWT summary reports submitted by each facility that applied tags in 1998 (Table 1). Thermal mark information was also derived from summary reports submitted by each facility.

### *Coded Wire Tag Applications During 1998*

#### **Main Bay Hatchery**

Main Bay hatchery tagged sockeye salmon smolt from the 1996 brood year Eyak and Eshamy stocks. A pipeline failure in January of 1996 caused the premature death of most of the eggs being incubated. A few million survivors were released in the spring of 1998 as smolt. All stocks released were tagged at a 40:1 ratio.

A total of 180,940 Eyak stock smolt with an average weight of 11.3 grams were released at Main Bay hatchery of which 4,505 contained tags. In addition, another 109,827 brood year 1997 Eyak stock fry with an average weight of 0.5 grams were released into Solf lake of which 2,830 contained tags. No Coghill stocks were released. Two groups of Eshamy stock smolt were released. One release contained 1,052,205 smolt with an average weight of 6.5 grams containing 26,469 tagged fish. The other release contained 1,432,99 smolt with an average weight of 11.7 grams containing 35,940 tagged fish. These fish were all released at Main Bay hatchery (Table 1).



## Gulkana Hatchery

The hatchery operation at Gulkana is not typical. This hatchery releases emergent fry into under-utilized lakes and then captures the out migrating smolt the following year for enumeration and tagging. The smolt migration from Summit lake started on May 29 and continued through July 13 with the smolt averaging 5.7 grams. A total of 975,211 smolt migrated from the lake, of which 64,890 contained valid tags for a tagging ratio of 15:1. Crosswind lake's smolt migration was less compressed than the last two seasons. A total of 1,253,784 smolt averaging 12.8 grams migrated from Crosswind lake. The migration started on May 29 and was completed by July 9. A total of 101,050 valid tagged smolt were included in the total migration for a tagging ratio of 12.4:1. Applying CWT's to this group of migrating sockeye salmon was skewed towards the early portion of the migration this season because the tagging personnel were expecting a high volume of migrating fish early in the season, but the migration was extended rather than compressed. As a result, approximately 87% of the tags were applied to the first 15% of the out migration (Table 1). An additional tag application machine was sent to the Gulkana hatchery last year in an effort to avoid applying tags in a non-representative manner. Tagging crews failed, however, to recognize their over abundance of tagged smolt soon enough to make a corrective adjustment to provide representative tagging to the entire migration. Ideally, the tagging crew should maintain a 1:15 tagging ratio each day, but since wild migration timing is unknown maintaining that ratio is not practical, but care must be used to avoid getting too far ahead or behind.

Prior to 1996, a set number of tags were applied to the migrating smolt from two stocked lakes, Summit and Crosswind. The result of this application method was that tag ratios varied widely between the two lakes and between years. These wide variations prevented the tagged fish recoveries from being used inseason as a management tool. Contribution rates could only be made after tags were decoded, and this took from 5 to 10 days. Starting in 1996 a tag ratio of 1:15 was established as the standard ratio to be used for both lake systems each season. Once all the year classes returning are from these standard tagging ratio releases, inseason hatchery contributions can be calculated using only detected-tag information. Managers can then use this information in determining fishing time and area both in the commercial gill net fishery and in the sport dip net fishery as it would be generally available within 48 hours of a fishery closure.

## ***Thermal Mark Application To Brood Year 1997 Pink Salmon***

### **A. F. Koernig Hatchery**

Otoliths of pink and chum salmon at this hatchery were thermal marked with one four (4) ring band as the base mark. Several modules of pink salmon incubators were also marked with accessory marks which were laid down after the hatch was complete. A total of 105.97 million thermal marked pink salmon fry were released at the hatchery site. Within that total were 19.14 million fry that had a three (3) ring accessory mark and 20.15 million fry that had a four (4) ring accessory mark applied to their otoliths. Both of the accessory marks indicate the same late large release. A total of 66.68 million fry were released into the plankton bloom which contained only the base otolith mark.

A total of 10.1 million chum salmon fry weighing 1.5 grams were released on site. These fry carried a base mark of a single band of four (4) rings and an accessory mark of two (2) rings on their otoliths.

All of the eggs at AFK hatchery were spawned at WHN hatchery in 1997 and shipped to the AFK hatchery after they reached the eyed stage. Thermal marking of the pink salmon occurred after the eggs were seeded into incubators at the AFK hatchery. All of the chum salmon eggs were thermally marked at the WHN hatchery prior to transport.

### **W. H. Noerenberg Hatchery**

All chum salmon fry and all, but 60,000 pink fry released at WHN hatchery and at the Port Chalmers remote chum salmon release site received thermal marks. The 72.95 million pink salmon released at the WHN hatchery into the plankton bloom received a base mark prior to hatching of one band with eight (8) rings. Another 30.72 million pink salmon fry were released on site with this base mark and an accessory mark of three rings in one band applied to their otoliths after they hatched to distinguish them as a late, large-release rearing group.

A total of 77.45 million chum salmon divided into two groups were released at the WHN hatchery site. The first group, 38.94 million fry, was marked with one band of three (3) rings followed by a second band of two (2) rings applied prior to hatch. The second release group involved 38.51 million chum salmon fry and had one band of three (3) rings followed by a second band with four (4) rings applied before hatch. The first group was released in mid-May and the second group was released later in May.

A total of 22.00 million chum salmon were remote released at Port Chalmers. Three different thermal marks were applied to these fish to study the time of release, however because a storm caused the premature release of one pen and low level fin rot required the release of all the remaining fish at a later date the experiment was abandoned. The three thermal marks were one band of two (2) rings followed by a band of four (4) rings, a band of two (2) rings followed by a band of three (3) rings, and finally a band of three (3) rings followed by a band of (5) rings. All of these marks represent the Port Chalmers release, but nothing more.

### **Cannery Creek Hatchery**

All 137.57 million pink salmon fry released at the Cannery Creek hatchery had the same thermal mark applied to their otoliths. The Cannery Creek base mark is composed of one band of 3 rings followed by a second band of three rings prior to hatch. This hatchery did have a boiler malfunction in the middle of the marking project which caused some extra wide gaps between some rings during the marking process to some groups. This glitch mark will not be a problem as they do not resemble any of the other hatchery marks.

### **Solomon Gulch Hatchery**

All 195.16 million of the Solomon Gulch hatchery pink salmon received a thermal mark on their otoliths. This mark was composed of one band with six rings. Even though there were some instances where the water temperature during the heating cycle failed to stabilize at four degrees above ambient, it did not appear to affect the quality of the mark.

### ***Hatchery Contributions Of Sockeye, Chum And Coho Salmon to the 1998 Harvest Based On Coded Wire Tag Recoveries***

The Main Bay hatchery contributions of sockeye salmon to the common property and cost recovery fisheries within each district were estimated for each statistical week for the 1998 fishing season. Gulkana hatchery contributions of sockeye salmon to the common property and personal use fisheries were estimated by period for the 1998 season. Hatchery contributions of sockeye salmon to the brood stock for each hatchery were estimated by statistical week for the 1998 season.

The hatchery contribution of chum salmon to the common property, cost recovery and brood stock was done postseason using the total salmon captured rather than by period or statistical week.

The hatchery contribution of coho salmon to the common property, cost recovery and brood stock was done postseason using the total salmon captured rather than by period or statistical week.

### **Common Property Harvest Estimates of Sockeye Salmon**

The 1998 sockeye salmon common property catch in PWS including the Copper and Bering River Districts is estimated to be 1.547 million fish. The return to Main Bay hatchery from the early run zero-check release was estimated at 0.9 thousand sockeye salmon. The early run and late run sockeye stocks are being dropped as brood stocks and therefore a targeted egg take did not occur on those returns. Approximately 320 early run fish were harvested in the Copper River district (Table 6). An additional 350 were captured during cost recovery operations (Table 3). The 250 early run sockeye that were used in the brood stock were captured incidental to the mid-run brood. (Tables 4).

The return from the mid-run release was 196.8 thousand sockeye salmon. A total of 103.7 thousand mid-run sockeye salmon were taken in the common property fishery (Table 2) including 3.9 thousand fish taken in the Copper River District (Table 6). Another 82.4 thousand were taken during cost recovery (Table 3). An estimated 10.7 thousand mid-run fish were utilized as brood stock (Table 4).

The return from the late run release was estimated at 67.3 thousand sockeye salmon. The common property catch of the hatchery late run sockeye salmon was estimated to be 46.4 thousand adults (Table 2) none of which were taken in the Copper River District. An estimated total of 21.0 thousand late run sockeye salmon were cost recovered (Table 3) and none were used as brood stock (Table 4). The late run contribution was estimated as no CWT's were applied to the dominant returning year class when they were released and as such, actual contributions could not be calculated.

The return to the Copper, Bering River District was 2.217 million sockeye salmon which does not include the escapements into the Copper River Delta systems. The commercial common property catch in the Copper, Bering River District was 1.34 million sockeye salmon. The escapement past the sonar counters at Miles Lake totaled 867 thousand sockeye salmon. The Gulkana hatchery contribution to this return is not precise since accurate smolt migration numbers from hatchery stockings are not known for the Paxson lake stockings. Based on CWT recoveries, smolt migration estimates, and an assumed average survival for the Paxson lake fish, the hatchery

contribution to the Copper River run was estimated to be 659.0 thousand sockeye salmon (Tables 6, 7 and 8).

The Gulkana hatchery contributed an estimated 525.0 thousand sockeye salmon to the commercial gillnet fishery from stockings in Crosswind, Summit and Paxson lakes. The commercial fishery caught 330.6 thousand Crosswind lake and 19.4 thousand Summit lake sockeye salmon. Since Paxson lake stockings are not marked, no estimation using CWT's can be made. It is assumed that the survivals of the Paxson lake stockings are the average of those of Summit and Crosswind lakes which results in an estimated commercial catch of 175.0 thousand Paxson lake sockeye salmon (Table 6).

The Personal Use fishery on the Copper River had an estimated harvest of 141.8 thousand sockeye salmon which included an estimated 33.1 thousand hatchery produced sockeye salmon. The lack of an adequate sampling program in the Personal Use fishery and subsistence fishery probably under estimated the hatchery contribution, no information is available however to adjust the estimated number. Again, the Paxson lake contribution had to be estimated without the aid of CWT recovery data (Table 7). In addition, an estimated 65.9 thousand sockeye were taken in the subsistence fishery in the Copper River which were not scanned for CWT's. Some hatchery contribution was undoubtedly made to this fishery, but the number is unknown.

The hatchery produced sockeye salmon that were used as brood stock or were excess brood stock at Gulkana hatchery totaled 34.0 thousand adults. Sockeye salmon returning to Crosswind lake and the late run sockeye salmon that returned to Summit lake were scanned for CWT's and an estimation was made to the proportion that were hatchery produced. All sockeye salmon returning to the Gulkana hatchery sites were assumed to be hatchery produced (Table 8). Since sockeye salmon returning to the Gulkana hatchery do not carry CWT's and a small local population of wild fish exists, assignment of all fish returning to the hatchery is not strictly valid. One could argue, however, that since the local population is composed primarily of fish released from the hatchery, the local 'wild' population could indeed be looked upon as a hatchery population. Approximately 15.7 thousand adults were allowed to spawn naturally in the spring water creeks below the hatchery. The total number of hatchery produced sockeye salmon that passed the Miles lake sonar is estimated to be 160.7 thousand fish.

Returns of fish reared at the Main Bay hatchery include adult sockeye salmon returns from remote releases at Coghill lake. Returns to Coghill lake weir amounted to 29.0 thousand sockeye salmon, of which 1.9 thousand were hatchery produced and 27.0 thousand were wild (Table 5). Contributions to the common property fishery by hatchery released Coghill lake pre-smolt stockings was approximately 2.2 thousand adults. The common property catch of wild Coghill lake sockeye salmon in the Coghill districts was 36.2 thousand fish (Table 6). A directed cost recovery harvest did not occur at Coghill lake, however, 7.9 thousand wild Coghill lake sockeye were caught incidental to the Main Bay hatchery cost recovery programs (Table 3). The total return from Coghill lake production was 75.2 thousand adult salmon which was composed of 71.0 thousand wild fish and 4.2 thousand hatchery released pre-smolt (Tables 2,3&5). The

hatchery pre-smolt contribution came from brood year 1993 and 1994 which were stocked into Coghill lake in 1994 and 1995 respectively.

The weir at Eshamy lake was not funded for operation this year and as a result actual fish counts into the lake are not available nor were fish scanned for CWT's. Since CWT's were not applied to the hatchery release for this year's adult return no estimation of contribution could be made outside of the Main Bay subdistrict. Estimations made within the Main Bay subdistrict were pure speculation.

### **Cost Recovery Harvest Estimates Of Sockeye Salmon**

Main Bay hatchery cost recovered 111.0 thousand sockeye salmon. The cost recovery occurred on the Eyak, Coghill and Eshamy stocks that returned to Main Bay hatchery in 1998. Cost recovery of 36.8 thousand sockeye salmon also occurred in 1998 on the sockeye salmon produced by the Gulkana hatchery bound for Crosswind Lake. The cost recovery harvest at Main Bay hatchery included 7.2 thousand wild fish (Table 3). The cost recovery harvest at Main Bay was based on pre-season contract sales which were tied to a grounds price to reach a revenue goal. A cost recovery harvest occurred again at the Gulkana hatchery this season. A total of 82.4 thousand sockeye were captured at a weir in the river draining Crosswind lake and 36.8 thousand were sold.

### ***Hatchery Contributions Of Thermal Marked Pink Salmon to the 1998 Harvest***

Only pink salmon returning in 1998 contained thermal marks. The common property fishery contribution using otolith marks was calculated by district and period. The cost recovery and brood stock contributions were calculated by district and statistical week.

### **Common Property Harvest Estimates Of Pink Salmon**

The 1998 documented pink salmon return to PWS including the Copper and Bering rivers was 30.81 million and ranks fifth out of the last 20 years. The total harvest in PWS was 28.16 million pink salmon. The common property pink salmon harvest was 19.63 million and 8.53 million were taken during cost recovery fisheries which includes roe stripped fish. In addition, 1.25 million were taken as brood stock and 1.4 million naturally escaped into index streams. The WHN hatchery produced the largest hatchery return this season with 7.50 million fish. The AFK hatchery was the second highest producing hatchery with a documented return of 6.97 million

fish. The Cannery Creek hatchery had the next highest return with 6.48 million fish followed by Solomon Gulch hatchery with 4.64 million fish (Table 9). The WHN, AFK and Cannery Creek hatcheries all had an undocumented number of pink salmon remaining at the end of the season which could have been harvested if the salmon processing plants had not ceased buying pink salmon 7 to 14 days earlier than normal. The WHN hatchery had an estimated 0.9 million pink salmon remaining, the Cannery Creek hatchery had an estimated 0.6 million fish remaining and the AFK hatchery had an estimated 0.3 million fish remaining. These fish were not included in the total as they were an undocumented estimate. Stream escapements were strong all around PWS with many areas having pink salmon in excess of escapement needs.

The cost recovery catch numbers do not match the numbers generated from cost recovery fish tickets because of the sale of spawned pink salmon brood stock and Solomon Gulch hatchery. In order to avoid counting brood fish twice, carcasses that were sold after spawning were not included in the cost recovery catch total as they were already counted in the brood stock total.

In 1998, pink salmon produced by the AF Koering hatchery comprised the largest portion of the common property harvest. The remaining common property harvest was produced, in order of abundance by Cannery Creek hatchery, WHN hatchery, wild stocks and Solomon Gulch hatchery (Table 10). In general, the largest contributor to a district was the nearest hatchery producing pink salmon.

The contribution by PWSAC to the common property fishery amounted to 14.71 million pink salmon. The total number of pink salmon caught in the cost recovery harvest by PWSAC amounted to 5.39 million fish. The total number taken for brood stock at PWSAC hatcheries was 913 thousand fish. Thus, the corporation's share was 6.3 million pink salmon. The post season analysis indicates that the PWSAC cost recovery and brood stock amounted to 30.0% of the corporation's contribution to the PWS pink salmon return ( $\text{Corporation share} / (\text{Common Property contribution} + \text{Corporation share})$ ).

### **Cost Recovery Harvest Estimates Of Pink Salmon**

Cost recovery harvests were stratified by statistical week. Daily harvests were not sampled in all cases, so a number of daily strata had to be combined. In general, contributions to cost recovery harvests from hatcheries other than the one of origin were small. The pink salmon cost recovery harvest contribution by the Solomon Gulch hatchery was the highest at 3.08 million adults. The remaining hatchery cost recovery contributions of pink salmon are in the following order of abundance: WHN, 2.43 million; AFK, 1.58 million; Cannery Creek, 1.30 million; and wild fish, 0.1 million (Table 11).

## **Brood Stock Estimates Of Pink Salmon**

Brood stock composition was found to be composed of almost all hatchery fish and moreover fish from the hatchery where they were released (Table 12). This contrasts with previous estimates made from coded wire tags and questions the validity of some of the assumptions made in the coded wire tag program.

### ***Hatchery Contributions Of Unmarked Salmon To The 1998 Harvest***

## **Common Property Harvest Estimates of Chum and Coho Salmon**

The chum salmon return to Eshamy and Coghill Districts totaled 1.041 million adults. The WHN hatchery production was calculated to be 918.3 thousand chum salmon adults (total catch - (historical average wild catch prior to 7/31 in Coghill District + 1994 wild catch in Eshamy District) + brood and excess brood). The common property chum salmon catch in the Coghill District was 368.9 thousand and 0.5 thousand in the Eshamy District which was composed of 247.3 thousand hatchery produced chum salmon. The cost recovery catch in the Coghill District was 491.1 thousand and 0.5 thousand in the Eshamy District. The total brood stock available was 179.9 thousand which includes holding mortality and fish remaining after the egg take was complete.

The Port Chalmers common property catch totaled 202.3 thousand chum salmon. These fish were produced from remote released chum fry from WHN hatchery. No cost recovery occurred at this location and none of the fish were used as brood stock.

The total chum salmon return to the Valdez area, subdistricts 50, 60 and 61, was 97.8 thousand adults. The common property catch in the Eastern District for the above subdistricts was 67.1 thousand adults. The total cost recovery catch of chum salmon at Solomon Gulch hatchery was 3.9 thousand fish. The total number of chum salmon that were excess brood and salvaged for roe was 24.8 thousand adults. Additionally, there were 2.1 thousand chum salmon that died within the hatchery raceway complex. The Solomon Gulch hatchery production was calculated to be 30.8 thousand chum salmon (total CPF catch - (historical wild chum salmon CPF catch in the Valdez statistical area) + brood and excess brood).

The total coho salmon return to the Valdez area was estimated at 97.7 thousand adults. This estimation was made without the input from sport fish state wide harvest surveys as they will not be generated until next year. After the removal of the historical wild catch from that area the total



hatchery contribution is estimated to be 96.7 thousand fish which equates to 7.4% survival from release.

The total coho salmon return to the Coghill District was estimated to be 6.4 thousand adults. The same problem exists for the sport fish catch in this area as it does in the Valdez area. After the removal of the historical wild catch the hatchery return is estimated to be 5.4 thousand which equates to 5.2% survival. An additional 5.1 thousand coho were estimated to have returned to the remote release locations for harvest by sport fishing anglers. Since actual harvest numbers are not available from the Sport Fish division this number was created by multiplying the smolt release number by the WHN hatchery survival rate.

### **Cost Recovery Harvest Estimates of Chum Salmon**

The WHN hatchery cost recovered 491.1 thousand chum salmon. Main Bay hatchery also cost recovered 0.5 thousand chum salmon incidental to their sockeye salmon harvest.

A directed cost recovery did not occur at the Solomon Gulch hatchery, but 3.9 thousand chum salmon were captured incidental in the pink salmon cost recovery. In addition, 24.8 thousand adult chum salmon were salvaged for their roe at the hatchery as that hatchery is no longer propagating that species.

### ***Survival Rates Of Pink and Sockeye Salmon Hatchery Releases***

This year the pink salmon survival rates were higher in all portions of PWS. The survival rate associated with the AFK hatchery was the highest overall at 13.3%; Two different release groups at the AFK hatchery occurred. Those fish released with long term rearing and released late in the spring had a survival rate of 14.2% while those released into the plankton bloom survived at 11.3%. The overall survival rate associated with the WHN hatchery was 7.0%, again there were two release strategies involved at the WHN hatchery. Those fry released late and large survived at 11.2% while those fry released into the plankton bloom survived at 5.38%.

The Cannery Creek hatchery had a survival rate of 4.7% and only had one type of release. The survival rate of fish released from the Solomon Gulch hatchery was the lowest at 2.5% and only one release type was made. The undocumented fish that were left in the water at AFK, Cannery Creek and WHN hatcheries were not included in the calculation of survivals.

Sockeye salmon survivals from brood year 1993 are complete (Table 13). The brood year 1994 survivals are only partially complete as the three ocean fish will return in the summer of 1999.

The 1994 brood year is listed to provide a look at the trend for some of the release groups, but will not be conclusive until next year.

## CONCLUSIONS

- 1) Hatchery production of pink salmon in PWS was good at the PWSAC hatcheries in 1998 and below average at the Solomon Gulch hatchery.
- 2) Main Bay hatchery releases of Coghill sockeye salmon as presmolt into Coghill lake produced few adults, but the adults that did return, migrated into the lake without delays.
- 3) The release of large pink salmon fry later in the season produced survival rates at about twice that of the fry released earlier into the plankton bloom at WHN hatchery, but only slightly better than the plankton releases at the AFK hatchery. The AFK hatchery had exceptionally high survival rates compared to previous years and to the other hatcheries this year.
- 4) The four year old chum salmon return to WHN hatchery was very weak which is a continuation of the weakness of that brood year. It is expected to be weak as five year olds as well. The weak four year old age class was partially off set by a very strong three year old age class which could possible fore tell of a very large return in 1999.

## Tables

Table 1

Hatchery releases of sockeye and coho salmon by tag code in PWS during 1998

Hatchery	Species	Location of Release	Tag Code	Release Dates	Release Weight (gms)	Number Released	Number Tagged	Tag Ratio
W. H. Noerenberg	Coho	Lake Bay	310101	6/08	17.72	102,925	5,162	19.94
		Lake Bay	310102	6/08	16.37	102,593	5,186	19.78
Main Bay	Sockeye	Main Bay	310115	5/19	11.30	180,940	4,505	40.16
		Main Bay	312729	5/18	6.50	1,052,205	26,469	39.75
		Main Bay	312730	5/27	11.66	1,432,999	35,940	39.87
		Solf Lake	1301020810	5/23	0.51	109,827	2,830	38.81
Gulkana	Sockeye	Summit Lake	310103	6/16 - 6/19	5.15	200,223	11,271	17.64
		Summit Lake	310104	6/19 - 6/24	5.45	234,479	10,999	21.31
		Summit Lake	310105	7/01 - 7/07	6.01	85,781	8,591	9.98
		Summit Lake	310110	6/02 - 6/17	5.47	273,376	16,680	16.39
		Summit Lake	310112	6/24 - 6/26	5.45	20,279	5,744	3.53
		Summit Lake	310113	6/26 - 6/29	5.36	92,540	5,791	15.98
		Summit Lake	310114	6/29 - 7/01	5.28	67,975	5,810	11.70
		Crosswind Lake	310107	5/30 - 6/05	9.80	77,058	33,235	2.32
		Crosswind Lake	310108	6/02 - 6/06	9.02	70,663	33,934	2.08
		Crosswind Lake	310109	6/08 - 7/10	12.70	1,104,263	33,909	32.57

Table 2

## Sockeye salmon hatchery contribution to PWS common property fisheries by CWT's

Coghill District Common Property		Releases at Main Bay Hatchery								Remote Releases						Wild		Total Catch
		Coghill		Eshamy		Main Bay		Eyak		Coghill R.		Other		Coghill Presmolt				
Ending Dat	Stat Week	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
06/20	25 1/					464	28.4									1,169	71.6	1,633
06/27	26					2,528	28.8									6,264	71.2	8,792
07/04	27					9,705	52.9			1,087	5.9					7,558	41.2	18,350
07/11	28 2/					10,106	52.9			1,132	5.9					7,871	41.2	19,109
07/18	29															0	0.0	0
07/25	30															5,041	100.0	5,041
08/01	31															6,037	100.0	6,037
08/08	32															433	100.0	433
08/15	33															1,430	100.0	1,430
08/22	34															344	100.0	344
08/29	35															10	100.0	10
Subtotals		0	0.0	0.0	0.0	22,803	37.3	0	0.0	2,219	3.6	0	0.0	0.0	0.0	36,157	59.1	61,179.0

1/ Proportions from Week 26 were used to calculate hatchery contribution estimates.

2/ Proportions from Week 27 were used to calculate hatchery contribution estimates.

Table 2

## Sockeye salmon hatchery contribution to PWS common property fisheries by CWT's

Eshamy District		Releases at Main Bay Hatchery								Remote Releases						Wild		Total Catch
Common Property 1/		Coghill		Untagged Eshamy		Main Bay		Eyak		Coghill R.		Eshamy R.		Coghill Presmolt				
Ending Dat	Stat Week	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
08/02	31 2/			36,366	37.6	60,474	62.4									0		96,840
08/09	32 2/			5,699	37.6	9,476	62.4									0		15,175
08/16	33 2/			3,022	37.6	5,026	62.4									0		8,048
08/23	34 2/			1,304	37.6	2,168	62.4									0		3,472
Subtotals		0	0	46,391.0	37.6	77,144	62.4	0.0	0.0	0.0	0.0	0	0	0	0	0	0.0	123,535

1/ Catch includes Main Bay sockeye salmon released in May of 1996 which were not tagged

2/ Proportions from week 30 of Eshamy cost recovery catch was used to calculate hatchery contribution

Table 3

## Sockeye salmon hatchery contribution to PWS cost recovery fisheries by CWT's

Main Bay Cost Recovery 1/		Releases at Main Bay Hatchery								Remote Releases						Wild		Total Catch
		Untagged Coghill		Untagged Eshamy		Main Bay		Eyak		Coghill R.		Eshamy R.		Coghill Presmolt				
Ending Dat	Stat Week	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
06/27	26	71	0.4	606	4.1	15,286	89.5	356.0	2.1							1,371	8	17,084
07/04	27	16	0.4			2,550	65.3									1,339	34.3	3,905
07/11	28	87	0.4			15,818	75.1									5,164	24.5	21,069
07/18	29	61	0.4			14,037	95.5											14,704
07/25	30	227	0.4	20,353	37.1	34,223	62.4											54,803
Subtotals		462	0.4	20,959.0	18.8	81,914	73.4	356.0	0.3	0	0.0	0	0.0	0	0.0	7,874	7.1	111,565

1/ Catch includes Main Bay sockeye salmon released in January and May of 1996 which were not tagged

Table 4

## Sockeye salmon hatchery contribution to PWS hatchery brood stocks by CWT's

Main Bay Hatchery Rack Return 1/		Releases at Main Bay Hatchery								Remote Releases						Wild		Total Catch
		Untagged Coghill		Main Bay		Eshamy		Eyak		Coghill R.		Marsha Bay L.		Coghill (Davis)				
Date	Stat Weeks	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
6/07 - 8/29	24 - 35	129		10,598		73		251				38						11,089
Subtotals		129	1.2	10,598	95.6	73	0.7	251	2.3	0	0.0	38	0.3	0	0.0	0	0.0	11,089

1/ Rack return includes Main Bay sockeye salmon released in January which were not tagged



Table 5

Sockeye salmon hatchery contribution to the Coghill River escapement by CWT's

Coghill Weir	Ending Dat	Stat Week	Releases at Main Bay Hatchery						Remote Releases						Wild			Total Catch		
			Coghill		Eshamy		Main Bay		Eyak		Coghill R.		Eshamy R.		Coghill Presmolt					
			No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.		%	
06/20		25																47	100	47
06/27		26																180	100	180
07/04		27																700	94.7	739
07/11		28																5,263	97.1	5,421
07/18		29																6,397	93.6	6,833
07/25		30																8,671	90.1	9,625
08/01		31																4,438	96.3	4,611
08/08		32																1,354	89.9	1,507
Subtotals			0	0	0	0	0	0	0	0	0	0	0	0	0	1,913	6.6	27,050	93.4	28,963

Table 6

## Sockeye salmon hatchery contribution to Copper River common property fisheries

Copper River District																Total Catch
Date	Period	Main Bay		Coghill River		Other		Crosswind Lake		Summit Lake		Total Hatchery		Wild + Paxson Lk. 1/		
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
5/14 - 5/15	1									591	1.2	591	1.2	49,000	98.8	49,591
5/18 - 5/19	2	79	0.1							47	0.1	126	0.2	69,372	99.8	69,498
5/22	3	0	0.0							180	0.2	180	0.2	81,935	99.8	82,115
5/25	4	0	0.0							662	0.6	662	0.6	108,231	99.4	108,893
5/28 - 5/29	5	0	0.0							641	1.1	641	1.1	57,993	98.9	58,634
6/01 - 6/02	6	0	0.0							1,295	1.2	1,295	1.2	105,142	98.8	106,437
6/04 - 6/05	7	0	0.0							689	1.0	689	1.0	68,814	99.0	69,503
6/08 - 6/09	8	240	0.3					535	0.7	1,017	1.4	1,792	2.4	72,350	97.6	74,142
6/11 - 6/12	9	0	0.0					1,157	1.7	299	0.4	1,456	2.1	68,173	97.9	69,629
6/15 - 6/16	10	0	0.0					8,804	14.2	0	0.0	8,804	14.2	53,247	85.8	62,051
6/18 - 6/19	11	0	0.0					5,567	14.3	0	0.0	5,567	14.3	33,455	85.7	39,022
6/22 - 6/23	12	2251	4.5					21,808	43.4	1,014	2.0	25,073	49.9	25,129	50.1	50,202
6/26	13	0	0.0					31,820	73.6	0	0.0	31,820	73.6	11,391	26.4	43,211
6/29	14	0	0.0					34,353	76.8	354	0.8	34,707	77.6	10,021	22.4	44,728
7/02 - 7/03	15	0	0.0					47,151	64.5	2,936	4.0	50,087	68.5	22,985	31.5	73,072
7/06 - 7/07	16	1,541.0	2.0					50,467	65.3	2,177	2.8	54,185	70.1	23,146	29.9	77,331
7/09 - 7/11	17	0.0	0.0					46,083	64.1	2,750	3.8	48,833	67.9	23,063	32.1	71,896
7/13 - 7/14	18	0.0	0.0					19,847	46.3	1,180	2.8	21,027	49.0	21,846	51.0	42,873
7/16 - 7/18	19	0.0	0.0					13,677	35.5	871	2.3	14,548	37.8	23,987	62.2	38,535
7/20 - 7/21	20	91.0	0.3					10,936	41.2	862	3.2	11,889	44.8	14,676	55.2	26,565
7/23 - 7/25	21							9,966	45.8	0	0.0	9,966	45.8	11,778	54.2	21,744
7/27 - 7/28	22							11,396	46.3	536	2.2	11,932	48.5	12,673	51.5	24,605
7/30 - 8/01	23							6,072	47.5	723	5.7	6,795	53.2	5,983	46.8	12,778
8/03 - 8/04	24							2,977	27.0	422	3.8	3,399	30.9	7,618	69.1	11,017
8/06 - 8/08	25 2/							1,238	27.0	176	3.8	1,414	30.9	3,168	69.1	4,582
8/10 - 8/11	26							1,272	35.4			1,272	35.4	2,324	64.6	3,596
8/13 - 8/14	27							2,345	100.0			2,345	100.0	0	0.0	2,345
8/17 - 8/18	28 3/							1,879	100.0			1,879	100.0	0	0.0	1,879
8/20 - 8/21	29 3/							1,218	100.0			1,218	100.0	0	0.0	1,218
Subtotals		4,202	0.3	0	0.0	0	0.0	330,568	24.6	19,422	1.4	354,192	26.4	987,500	73.6	1,341,692

1/ Paxson Lake hatchery contribution estimated to be about 175,000 fish : hatchery contribution from Paxson Lake is included with wild fish.

2/ Proportions from period 24 were used to calculate contribution estimates

3/ Proportions from period 27 were used to calculate contribution estimates

Table 7

## Sockeye salmon hatchery contribution to Copper River personal use fishery

Chitina Personal Use 1/																Total Catch
Date	Period	Main Bay		Coghill River		Other		Crosswind Lake		Summit Lake		Total Hatchery		Wild + Paxson Lk. 1/		
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	
6/01 - 6/07	1											0	0.0	5,451	100.0	5,451
6/08 - 6/14	2											0	0.0	24,355	100.0	24,355
6/15 - 6/21	3											0	0.0	26,200	100.0	26,200
6/22 - 6/28	4											0	0.0	19,004	100.0	19,004
6/29 - 7/05	5											0	0.0	9,670	100.0	9,670
7/06 - 7/12	6							956	8.0			956	8.0	11,004	92.0	11,960
7/13 - 7/19	7							2,948	24.7			2,948	24.7	9,007	75.3	11,955
7/20 - 7/26	8							6,287	48.0	430	3.3	6,717	51.3	6,379	48.7	13,096
7/27 - 8/02	9							3,549	42.3	373	4.4	3,922	46.7	4,470	53.3	8,392
8/03 - 8/09	10							2,569	62.1	0	0.0	2,569	62.1	1,568	37.9	4,137
8/10 - 8/16	11							0	0.0	858	25.4	858	25.4	2,524	74.6	3,382
8/17 - 8/23	12							1,783	100.0			1,783	100.0	0	0.0	1,783
8/24 - 8/30	13 2/							997	100.0			997	100.0	0	0.0	997
8/31 - 9/06	14 2/							763	100.0			763	100.0	0	0.0	763
9/07 - 9/13	15 2/							583	100.0			583	100.0	0	0.0	583
9/14 - 9/20	16 2/							25	100.0			25	100.0	0	0.0	25
9/21 - 9/27	17 2/							3	100.0			3	100.0	0	0.0	3
9/28 - 9/30	18 2/							0	0.0			0	0.0	0	0.0	0
Subtotals		0	0.0	0	0.0	0	0.0	20,463	14.4	1,661	1.2	22,124	15.6	119,632	84.4	141,756

1/ Paxson Lake hatchery contribution estimated to be about 11,000 fish : hatchery contribution from Paxson Lake is included with wild fish.

2/ Proportions from week 13 were used to calculate contribution estimates

Table 8

## Sockeye salmon hatchery contribution to Copper River escapement

Brood and Escapement Surveys		Gulkana Hatchery Brood Stock 1/	Crosswind Lake	Summit Lake	Total
Dates	Stat Week	Number	Number	Number	Number
7/19 - 7/25	30				0
7/26 - 8/01	31				0
8/02 - 8/08	32	115	808		923
8/09 - 8/15	33		5,086	148	5,234
8/16 - 8/22	34		11,182	194	11,376
8/23 - 8/29	35		12,980	60	13,040
8/30 - 9/05	36	877	10,513	0	11,390
9/06 - 9/12	37	3,054	9,155	322	12,531
9/13 - 9/19	38	4,490	14,724	471	19,685
9/20 - 9/26	39	4,991	15,791	335	21,117
9/27 - 10/3	40	3,755	2,164	509	6,428
10/4 - 10/10	41	1,058		350	1,408
10/11 - 10/17	42			323	323
Subtotals		18,340	82,403	2,712	103,455

1/ Table includes only fish used in egg take. Total number of sockeye salmon returning to nearby springs was 15,675.

Table 9      Pink salmon contribution by hatchery to PWS fisheries and brood stocks using otoliths

All Districts and all periods						
	Solomon Gulch	Cannery Creek	W.H. Noerenberg	A.F. Koernig	Wild	Total
CPF	1,226,679	4,869,014	4,817,354	5,037,454	3,689,711	19,640,212
Cost Recovery	3,076,945	1,305,144	2,427,120	1,582,038	138,779	8,530,026
Spawning Rack	334,551	304,945	264,143	343,978	3,760	1,251,377
Total	4,638,175	6,479,103	7,508,617	6,963,470	3,832,250	29,421,615

Table 10 Pink salmon hatchery contribution to PWS common property fisheries using otoliths

District:		212						Total
Date	Period	Solomon Gulch	Cannery Creek	W.H. Noeremberg	A.F. Koernig	Wild		
5/14-5/15	1	0	0	0	0	0		0
5/18-5/19	2	0	0	0	0	0		0
5/22-5/22	3	0	0	0	0	0		0
5/25-5/25	4	0	0	0	0	0		0
5/28-5/29	5	0	0	0	0	0		0
6/1-6/2	6	0	0	0	0	0		0
6/4-6/5	7	0	0	0	0	0		0
6/8-6/9	8	0	0	0	0	0		0
6/11-6/12	9	0	0	0	0	0		0
6/15-6/16	10	0	0	0	0	0		0
6/18-6/19	11	0	0	0	0	0		0
6/22-6/23	12	0	0	0	0	3		3
6/26-6/26	13	0	0	0	0	6		6
6/29-6/29	14	7	0	0	0	27	**	34
7/2-7/3	15	19	0	0	0	76	**	95
7/6-7/7	16	36	0	0	0	146	**	182
7/9-7/11	17	33	0	0	0	133	**	166
7/13-7/14	18	217	0	0	0	870		1087
7/16-7/18	19	224	0	0	0	2,158	**	2382
7/20-7/21	20	77	0	0	0	747		824
7/23-7/25	21	120	0	0	0	1,165	*	1285
7/27-7/28	22	130	65	0	0	2,013		2208
7/30-8/01	23	46	93	93	46	4,181		4459
8/03-8/04	24	0	0	0	0	6,082		6082
8/6-8/8	25	0	16	49	16	1,352		1433
8/10-8/11	26	0	0	0	0	399		399
8/13-8/14	27	0	0	0	0	100		100
8/17-8/18	28	0	0	0	0	56		56
8/20-8/21	29	0	0	0	0	28		28

TOTAL 909 174 142 62 19,542 20,829

\* Previous period used to apportion catch

\*\*Following period used to apportion catch

Table 10 Pink salmon hatchery contribution to PWS common property fisheries using otoliths

District:		221					
Date	Period	Solomon Gulch	Cannery Creek	W.H. Noeremberg	A.F. Koernig	Wild	Total
7/8	1	74,937	0	0	0	51,273	126210
7/12	2	49,663	0	0	0	37,707	87370
7/16	3	438,014	0	0	0	45,053	483067
7/18	4	112,381	0	0	0	67,429	179810
7/22	5	151,638	2,166	0	0	54,157	207961
7/22-7/24	6	80,827	3,149	0	0	16,795	100771
7/25	7	21,079	11,857	0	0	93,536	126472
7/27	8	4,537	1,134	0	0	103,208	108879
7/29	9	43,261	1,803	0	3,605	124,375	173044
7/31	10	26,480	8,148	2,037	0	167,024	203689
8/02	11	6,993	4,662	0	0	177,153	188808
8/04	12	1,422	8,533	0	0	122,304	132259
8/06	13	0	0	0	0	60,280	60280
8/09	14	0	0	0	0	15,316	15316
8/11	15	0	0	0	0	14,828	14828
8/13	16	0	504	252	252	10,835	11843
8/15	17	0	0	0	0	0	0
8/17	18	0	257	129	129	5,533	* 6048
8/19	19	0	86	43	43	1,842	* 2014
8/20-8/21	20	0	19	9	9	398	* 435
8/22-8/23	21	0	78	39	39	1,679	* 1835
8/24-8/25	22	0	5	2	2	105	* 114
8/26-8/27	23	0	0	0	0	8	* 8

TOTAL 1,011,232 42,401 2,511 4,079 1,170,838 2,231,061

\* Previous period used to apportion catch

\*\*Following period used to apportion catch

Table 10 Pink salmon hatchery contribution to PWS common property fisheries using otoliths

District:		222					
Date	Period	Solomon Gulch	Cannery Creek	W.H. Noeremberg	A.F. Koernig	Wild	Total
7/12	1	108,083	0	0	0	40,329	148412
7/16	2	9,617	401	0	0	16,830	26848
7/18	3	21,106	1,919	0	0	69,075	92100
7/22	4	12,232	26,910	0	0	78,285	117427
7/25	5	13,148	1,143	2,287	0	54,876	71454
7/27	6	12,839	0	11,005	0	47,686	71530
7/29	7	9,366	12,488	0	0	78,048	99902
7/31	8	0	14,266	6,713	0	59,580	80559
8/02	9	1,509	58,864	19,621	0	57,356	137350
8/04	10	0	58,142	4,689	0	22,507	85338
8/06	11	2,848	458,547	25,633	0	54,114	541142
8/09	12	2,225	307,096	48,957	0	35,606	393884
8/11	13	0	252,399	40,709	0	4,071	297179
8/13	14	6,300	548,095	25,200	0	0	579595
8/15	15	0	573,428	0	0	12,201	585629
8/17	16	0	549,064	71,901	0	6,537	627502
8/19	17	0	296,393	0	0	3,120	299513
8/20-8/21	18	0	373,556	141,498	5,660	22,640	543354
8/22-8/23	19	0	23,273	2,618	291	1,745	* 27927
8/24-8/25	20	0	11,572	1,302	145	868	* 13887
8/26-8/27	21	0	18,047	2,030	226	1,353	* 21656
8/28-8/29	22	0	8,510	957	106	639	* 10212
8/30-8/31	23	0	20,096	2,261	251	1,507	* 24115
9/1-9/2	24	0	24,018	2,702	300	1,802	* 28822
9/3-9/4	25	0	19684	2214	246	1477	* 23621
9/5-9/6	26	0	11,218	1,262	140	842	* 13462

TOTAL 199,273 3,614,209 407,381 6,679 673,094 4,962,420

\* Previous period used to apportion catch + Arbitrary assignment as no sample taken within 2 weeks

\*\*Following period used to apportion catch



Table 10 Pink salmon hatchery contribution to PWS common property fisheries using otoliths

District:		223					Total
Date	Period	Solomon Gulch	Cannery Creek	W.H. Noeremberg	A.F. Koernig	Wild	
6/15-6/16	1	0	0	0	0	1	1
6/19-6/19	2	0	0	0	0	0	0
6/22-6/22	3	0	0	0	0	3	3
6/25-6/26	4	0	0	0	0	76	76
6/29-6/30	5	0	0	0	0	394	394
7/02-7/03	6	0	0	0	0	1,476	1476
7/06-7/07	7	0	0	0	0	4,252	4252
7/09-7/10	8	0	0	0	0	6,302	6302
7/23-7/24	9	2,102	1,051	4,205	0	93,552	100910
7/27-7/28	10	0	5,299	86,553	0	77,722	169574
7/31-7/31	11	0	2,342	5,856	2,342	26,936	37476
8/06-8/06	12	0	1,025	2,563	1,025	11,787	16400
8/09-8/09	13	3,791	26,540	367,765	3,791	37,915	439802
8/11-8/11	14	0	31,368	254,861	7,842	19,604	313675
8/13-8/13	15	0	29,377	243,831	0	8,813	282021
8/15-8/15	16	0	22,723	213,031	8,521	28,405	272680
8/17-8/17	17	0	16,861	65,335	2,108	8,430	92734
8/19-8/19	18	0	12,447	117,560	1,383	0	131390
8/20-8/21	19	0	1,454	51,627	727	2,182	55990
8/22-8/23	20	0	23,942	82,599	1,197	7,182	114920
8/24-8/25	21	0	11,275	122,618	1,409	0	135302
8/26-8/27	22	0	0	174,629	1,878	3,755	180262
8/28-8/29	23	0	0	113,132	0	0	113132
8/30-8/31	24	0	0	148,643	0	0	148643
9/1-9/2	25	0	0	130,265	1,371	0	131636
9/3-9/4	26	0	0	159,982	0	0	159982
9/5-9/6	27	0	0	115,424	1,215	0	116639
9/7-9/8	28	0	0	80,339	0	0	80339
9/9-9/10	29	0	0	50,342	0	0	50342

TOTAL 5,893 185,704 2,591,160 34,809 338,787 3,156,353

\* Previous period used to apportion catch

\*\*Following period used to apportion catch

Table 10 Pink salmon hatchery contribution to PWS common property fisheries using otoliths

District:		225							Total
Date	Period	Solomon Gulch	Cannery Creek	W.H. Noeremberg	A.F. Koernig	Wild			
7/30-8/01	1	0	747	5,015	640	3,414	**		9816
8/03-8/04	2	0	1,968	13,212	1,687	8,995			25862
8/06-8/8	3	0	559	3,752	479	2,555	*		7345
8/10-8/11	4	0	2,465	16,548	2,113	11,266	*		32392
8/13-8/15	5	0	1,023	17,390	1,023	5,114			24550
8/17-8/18	6	0	0	15,881	1,513	3,025			20419
8/20-8/22	7	0	209	9,594	2,503	2,294			14600

TOTAL 0 6,971 81,392 9,958 36,663 134,984

\* Previous period used to apportion catch

\*\*Following period used to apportion catch

Table 10 Pink salmon hatchery contribution to PWS common property fisheries using otoliths

District:		226					Total
Date	Period	Solomon Gulch	Cannery Creek	W.H. Noeremberg	A.F. Koernig	Wild	
8/04	1	0	57,693	90,661	100,963	76,237	325554
8/06	2	0	80,462	108,860	184,588	80,461	454371
8/09	3	0	61,480	101,002	597,231	83,437	843150
8/11	4	2,981	83,456	89,417	396,415	65,572	637841
8/13	5	0	109,025	119,928	242,582	59,964	531499
8/15	6	3,823	80,292	141,467	432,048	76,469	734099
8/17	7	0	103,438	145,579	417,583	65,128	731728
8/19	8	0	75,310	103,999	426,756	82,482	688547
8/20-8/21	9	0	93,060	257,285	624,053	76,638	1051036
8/22-8/23	10	0	175,718	313,782	684,046	62,757	1236303
8/24-8/25	11	0	52,052	134,466	316,647	30,363	533528
8/26-8/27	12	0	10,386	41,543	147,479	0	199408
8/28-8/29	13	0	12,578	16,172	129,379	14,376	172505
8/30-8/31	14	0	5,005	18,770	91,347	5,005	120127
9/1-9/2	15	0	0	0	119,151	0	119151
9/3-9/4	16	0	0	14,978	41,606	0	56584

TOTAL      6,804      999,955      1,697,909      4,951,874      778,889      8,435,431  
 \* Previous period used to apportion catch  
 \*\*Following period used to apportion catch

Table 10 Pink salmon hatchery contribution to PWS common property fisheries using otoliths

District:		227						
Date	Period	Solomon Gulch	Cannery Creek	W.H. Noeremberg	A.F. Koernig	Wild		Total
	1	0	0	0	0	0		0
	2	0	0	0	0	0		0
	3	0	0	0	0	0		0
	4	0	0	0	0	0		0
	5	0	0	0	0	0		0
	6	0	0	0	0	0		0
	7	0	0	0	0	0		0
	8	0	0	0	0	0		0
	9	0	0	0	0	0		0
	10	0	0	0	0	0		0
	11	0	0	0	0	0		0
	12	0	0	0	0	0		0
6/29-6/30	13	0	0	0	0	2	**	2
7/1-7/3	14	651	0	0	0	12,155	**	12806
7/4-7/5	15	254	0	0	0	4,746	**	5000
7/6-7/7	16	3	0	0	0	56	**	59
7/8-7/10	17	10	0	0	0	199		209
7/11-7/12	18	38	0	0	0	747	*	785
7/13-7/14	19	519	0	0	0	10,330	*	10849
7/15-7/17	20	727	0	0	0	14,463	*	15190
7/18-7/19	21	366	0	0	0	7,273	*	7639
7/22-7/22	22	0	0	0	0			0
8/02-8/02	23	0	12,744	35,683	22,939	173,316		244682
8/04-8/04	24	0	4,995	999	5,994	82,914		94902
8/06-8/06	25	0	883	177	1,060	14,662	*	16782

TOTAL 2,568 18,622 36,859 29,993 320,863 408,905

\* Previous period used to apportion catch

\*\*Following period used to apportion catch

Table 10 Pink salmon hatchery contribution to PWS common property fisheries using otoliths

District:		228						
Date	Period	Solomon Gulch	Cannery Creek	W.H. Noeremberg	A.F. Koernig	Wild		Total
7/8	1	0	0	0	0	317	**	317
7/12	2	0	0	0	0	0		0
7/16	3	0	0	0	0	0		0
7/18	4	0	0	0	0	0		0
7/22	5	0	0	0	0	8,230	**	8230
7/25	6	0	0	0	0	5,211		5211
7/27	7	0	0	0	0	25,532		25532
7/29	8	0	0	0	0	29,667		29667
7/31	9	0	0	0	0	93,698		93698
8/02	10	0	689	0	0	64,760		65449
8/04	11	0	0	0	0	94,531		94531
8/06	12	0	289	0	0	27,157		27446

TOTAL            0            978            0            0            349,103            350,081  
 \* Previous period used to apportion catch  
 \*\*Following period used to apportion catch

Table 10 Pink salmon hatchery contribution to PWS common property fisheries using otoliths

District:		229***					Total
Date	Period	Solomon Gulch	Cannery Creek	W.H. Noeremberg	A.F. Koernig	Wild	
7/8	1	0	0	0	0	0	0
7/12	2	0	0	0	0	1	1
7/16	3	0	0	0	0	1	1
7/18	4	0	0	0	0	37	37
7/22	5	0	0	0	0	10	10
7/25	6	0	0	0	0	80	80
7/27	7	0	0	0	0	791	791
7/29	8	0	0	0	0	450	450
7/31	9	0	0	0	0	562	562
8/02	10	0	0	0	0	0	0
8/04	11	0	0	0	0	0	0
8/06	12	0	0	0	0	0	0

TOTAL	0	0	0	0	1,932	1,932
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\* Previous period used to apportion catch

\*\*Following period used to apportion catch

\*\*\*No samples taken, all catch allocated to wild

Table 11

Pink salmon hatchery contribution to PWS cost recovery fisheries using otoliths

District:	<b>221</b>					
Dates	Solomon Gulch	Cannery Creek	W.H. Noeremberg	A.F. Koernig	Wild	Total
6/20-6/29	124,311	0	0	0	0	124,311
6/30-7/03	415,016	0	0	0	8,830	423,846
7/04-7/06	577,181	0	0	0	12,280	589,461
7/07-7/10	927,776	0	0	0	19,740	947,516
7/11-7/13	525,356	0	0	0	16,947	542,303
7/14-7/17	397,464	0	0	0	0	397,464
7/18-7/21	109,841	0	0	0	6,035	115,876

TOTAL	3,076,945	0	0	0	63,832	3,140,777
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\* Previous period used to apportion catch

\*\*Following period used to apportion catch

Table 11      Pink salmon hatchery contribution to PWS cost recovery fisheries using otoliths

District:	222					
Dates	Solomon Gulch	Cannery Creek	W.H. Noeremberg	A.F. Koernig	Wild	Total
7/29-8/02	0	105,913	0	0	5,819	111,732
8/03-8/05	0	384,181	0	0	4,044	388,225
8/06-8/08	0	359,501	0	0	0	359,501
8/09-8/10	0	243,427	0	0	13,375	256,802
8/18-8/19	0	199,413	0	0	2,099	201,512

TOTAL	0	1,292,435	0	0	25,337	1,317,772
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\* Previous period used to apportion catch      +arbitrary assignment of excess brood sales

\*\*Following period used to apportion catch



Table 11      Pink salmon hatchery contribution to PWS cost recovery fisheries using otoliths

District:	<b>223</b>					
Dates	Solomon Gulch	Cannery Creek	W.H. Noeremberg	A.F. Koernig	Wild	Total
7/17-8/01	0	0	114,990	0	4,600	119,590
8/02-8/05	0	4,898	225,322	0	2,449	232,669
8/06-8/8	0	0	392,850	0	0	392,850
8/9-8/12	0	0	646,888	0	0	646,888
8/13-8/15	0	0	462,353	0	0	462,353
8/16-8/19	0	6,081	577,658	0	0	583,739

TOTAL	0	10,979	2,420,061	0	7,049	2,438,089
* Previous period used to apportion catch			+Arbitrary assignment of excess brood sales			
**Following period used to apportion catch						

Table 11      Pink salmon hatchery contribution to PWS cost recovery fisheries using otoliths

District:	225						
Dates	Solomon Gulch	Cannery Creek	W.H. Noeremberg	A.F. Koernig	Wild		Total
6-Jul	0	0	0	0	19		19
27-Jul	0	0	0	0	0		0
31-Jul	0	0	0	0	0		0
8/3-8/9	0	0	0	0	0		0
16-Aug	0	0	0	0	0		0

TOTAL	0	0	0	0	19		19
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\* Previous period used to apportion catch

\*\*Following period used to apportion catch

Table 11      Pink salmon hatchery contribution to PWS cost recovery fisheries using otoliths

District:	226					
Dates	Solomon Gulch	Cannery Creek	W.H. Noeremberg	A.F. Koernig	Wild	Total
7/29-8/01	0	1,730	0	159,162	5,190	166082
8/02-8/04	0	0	0	219,215	17,242	236457
8/05-8/07	0	0	2,607	234,585	13,033	250225
8/08-8/11	0	0	0	301,299	0	301299
8/12-8/15	0	0	0	249,328	2,625	251953
8/16-8/19	0	0	4,452	418,449	4,452	427353

TOTAL	0	1,730	7,059	1,582,038	42,542	1,633,369
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\* Previous period used to apportion catch

\*\*Following period used to apportion catch

## Pink salmon hatchery contribution to PWS hatchery brood stocks using otoliths

District:	221						
Period	Solomon Gulch	Cannery Creek	W.H. Noeremberg	A.F. Koernig	Wild		Total
7/23-7/24	16,631	0	0	0	0		16631
7/27-7/31	66,122	0	0	0	0		66122
8/3-8/8	92,072	0	0	0	0		92072
8/9-8/15	86,056	0	0	0	0		86056
8/19-8/21R	35,199	0	0	0	0	Roe	35199
8/24-9/3 R	24,243	0	253	0	0	Roe	24496
8/19-9/8	14027	0	0	0	0	system	14027
9/9-9/20	201	0	0	0	0	morts	201

TOTAL	334,551	0	253	0	0	334,804
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\* Previous period used to apportion catch

\*\*Following period used to apportion catch

Table 12      Pink salmon hatchery contribution to PWS hatchery brood stocks using otoliths

District:	222						
Period	Solomon Gulch	Cannery Creek	W.H. Noeremberg	A.F. Koernig	Wild		Total
8/28-8/29	0	21,026	934	0	0		21960
8/30-9/05	0	93,008	0	0	0		93008
9/06-9/12	0	90,011	0	0	0		90011
9/13	0	100,900	0	0	0	* system morts	100900

TOTAL	0	304,945	934	0	0		305,879
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\* Previous period used to apportion catch

\*\*Following period used to apportion catch

Table 12      Pink salmon hatchery contribution to PWS hatchery brood stocks using otoliths

District:	223						
Period	Solomon Gulch	Cannery Creek	W.H. Noeremberg	A.F. Koernig	Wild		Total
8/22-8/29	0	0	98,815	0	2,102		100917
8/30-9/5	0	0	104,386	0	0		104386
9/6-9/7	0	0	31,164	0	636		31800
9/08	0	0	28,143	0	574	* system morts	28717

TOTAL	0	0	262,508	0	3,312		265,820
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\* Previous period used to apportion catch

+Post egg take morts abitrarily assigned

\*\*Following period used to apportion catch

Table 12      Pink salmon hatchery contribution to PWS hatchery brood stocks using otoliths

District:	226						
Period	Solomon Gulch	Cannery Creek	W.H. Noeremberg	A.F. Koernig	Wild		Total
8/24-8/29	0	0	448	42,150	448		43046
8/30-9/05	0	0	0	54,298	0		54298
9/06-9/12	0	0	0	95,497	0		95497
9/13-9/17	0	0	0	57,033	0		57033
9/18	0	0	0	95,000	0	* system morts	95000

TOTAL	0	0	448	343,978	448		344,874
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\* Previous period used to apportion catch

+Post egg take morts abitrarily assigned

\*\*Following period used to apportion catch

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